E. BERLINER.

Electrical Contact-Telephone.

No. 222,652. Patented Dec. 16, 1879.

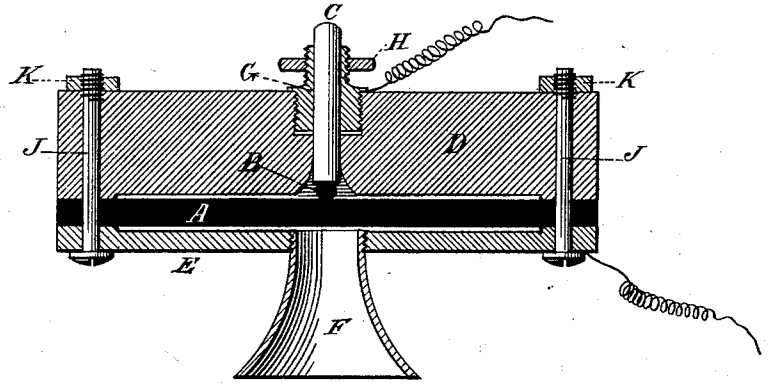


FIG. 1.

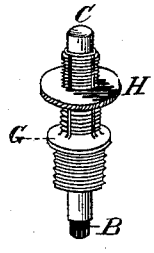


FIG. 2.

Witnesses:
C. F. Brown
E. W. Pierce

Inventor:
Emile Berliner
by his Atty.
Alex. L. Hayes

# UNITED STATES PATENT OFFICE.

EMILE BERLINER, OF BOSTON, MASSACHUSETTS.

## IMPROVEMENT IN ELECTRICAL-CONTACT TELEPHONES.

Specification forming part of Letters Patent No. **222,652**, dated December 16, 1879; application filed August 11, 1879.

*To all whom it may concern:*

Be it known that I, EMILE BERLINER, of Boston, in the county of Suffolk and State of Massachusetts, have invented a new and useful Improvement in Microphones or Contact-Telephones, of which the following is a specification, reference being had to the accompanying drawings.

In a caveat filed April 14, 1877, and in an application for a patent of the United States filed June 4, 1877, I have shown how articulate sounds may be transmitted telephonically by causing the sound-waves to affect a point of contact existing between two poles of an electric current. As shown in said caveat and application, each sound-wave striking the point of contact will cause a difference of pressure between the two sides of the point of contact, thus producing a proportional difference in the strength of the current, and will consequently give rise to electrical undulations which will correspond to the sound-vibrations which strike the contact. Since then a number of devices have been invented based upon this principle of varying the contact-pressure, to which the name of "microphone" has been given; and although the original anticipation which gave rise to this name has been but partially realized—that the instrument would magnify sound and be to the ear what the microscope is to the eye—I still have no hesitation in accepting that name for my invention, believing as I do that in many instances the action of contact-transmitters is microscopically small, and may occur between only two molecules, forming what is termed a "point of contact."

The present invention consists of the combination of a diaphragm of solid carbon or metal suitably supported in front of an air-chamber with a self-adjusting pin of carbon or metal convex upon the extremity in contact with the plate, which pin is permitted to slide or drop upon the carbon plate by its own weight, and is firmly fixed in the position then taken by any suitable clamping device.

In the accompanying drawings, Figure 1 is a sectional view of my invention, and Fig. 2 is a perspective view of the carbon pin and clamping device.

In these figures the same letters refer to the same parts.

A is a solid plate of hard carbon, (though a metal plate may be used, but carbon is preferred,) which is firmly clamped between the metal plate E and the wooden plate D by any suitable device—as, for instance, by the screws J J′, which pass through the three plates, and the nuts K K′ on these screws. A flat recess is cut in both the wooden and the metal plate in such a manner that they form two chambers, one on each side of the carbon plate, which thus becomes a diaphragm.

F is an ordinary speaking mouth-piece, which is suitably secured in the plate E. C is a metal pin having on one end a piece of hard carbon, B, the end of which toward the diaphragm has a curvilinear convex and polished surface. This piece of carbon is fastened to the metal pin in any suitable manner; but a desirable way of accomplishing this result is by spinning a part of the metal around the carbon, as shown in the patent to T. A. Watson, No. 217,561, July 15, 1879.

Instead of a metal pin with a piece of carbon upon its extremity, a pin entirely of carbon may be used, and it is desirable that the weight of this pin should be such that it will not bear heavily upon the carbon diaphragm.

Good results may be obtained when the pin is made wholly of metal; but it is preferable that the contacts should be of carbon.

It is preferable that the carbon which is used to form the carbon piece or pin should be prepared from a semi-hard and homogeneous carbon, such as is found in the carbon pencils used for producing the electric light, by exposing said carbon in pieces of the proper size—that is, about the size of the pin or piece to be used—to a high heat for about twelve hours in a retort in which hydrocarbons are being generated—as, for instance, a retort in which illuminating-gas is being generated—by which treatment the carbon is rendered exceedingly hard. The carbon so prepared can be turned in a lathe to the exact size required and the end polished with polishing-powder or polishing-paper.

One pole of the battery is connected to the plate A and the other to the pin B, and the

instrument is adjusted for use by dropping the pin through a perforation in the wooden block D, so that the pin B is at right angles to the plate A, and is just in contact by its weight with said plate, and it may then be fixed firmly in position by the clamp G and nut H on the same, or, if the plate is in proper position, not fastened.

It is advantageous that the carbon plate should be polished upon the surface under the end of the pin.

What I claim as my invention, and desire to secure by Letters Patent of the United States, is—

1. In combination with a diaphragm forming one pole of an electric current, the opposite non-elastic pole of said current, capable of sliding freely toward the diaphragm until both come into contact with one another, substantially as and for the purpose set forth.

2. The combination of two opposite electrodes, one of which has its weight so regulated as to exert a certain amount of pressure upon the other, slides toward the same, and is capable of being firmly set in position, substantially as and for the purpose set forth.

3. The combination of a metal or carbon diaphragm, A, forming one pole of an electric current, and a pin, B, forming the opposite pole of said current, the said non-elastic pin resting solely by its own weight upon the diaphragm, substantially as and for the purpose set forth.

4. The combination of the diaphragm A, arranged as described, and having air-chambers on each side, with the carbon pin B, capable of sliding into contact with the diaphragm, and a device for firmly fixing the said pin in position, substantially as and for the purpose set forth.

5. In a telephone, a piece of carbon for forming contact, which is first shaped into the required form, and is afterward hardened in a hydrocarbon-gas retort and polished, substantially as and for the purpose set forth.

In witness whereof I have hereunto set my hand on this 8th day of August, 1879, in presence of two witnesses.

EMILE BERLINER.

Witnesses:

ALEX. L. HAYES,

A. H. VINAL.